DOCUMENT RESUME

ED 435 933 CG 029 637

AUTHOR Adler, Helmut E.
TITLE Lillie Martin in Gottingen. Lillie Martin, Outstanding Scholar and Teacher: A Centennial Symposium.
PUB DATE 1999-08-00
NOTE 10p.; Paper presented at the Annual Convention of the American Psychological Association (107th, Boston, MA, August 20-24, 1999).
PUB TYPE Opinion Papers (120) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Conference Papers; Conferences; *Females; History; Professional Development; Professional Recognition; *Psychology; Research and Development
IDENTIFIERS *Psychophysics

ABSTRACT

This article reports on a symposium commemorating Lillien Martin's dissertation, "Analysis of Difference Sensations," by published in 1899. The symposium marked the centenary celebration in acknowledgement of Martin's pioneer efforts for women in the field of psychology. Psychophysics was concerned with the quantitative assessment of sense perceptions. Her dissertation work began by measuring different thresholds in weight perception to demonstrate that psychophysical measurements can be made to establish sensitivity to stimulus differences. In an attempt to determine differences to stimuli, Martin and her mentor, Georg Elias Muller, investigated factors that could affect the results of these measurements. Circumstances interfered with her completion of her work in psychophysics. She went on to contribute other research to the field of psychology. (JDM)

Reproductions supplied by EDRS are the best that can be made
from the original document.

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
H. ADLER
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

ED 435 933

Lillie Martin, Outstanding Scholar and Teacher: A Centennial Symposium

Lillie Martin in Göttingen

Helmut E. Adler

Yeshiva University

Acknowledgment: I wish to thank my wife, Dr. Leonore Loeb Adler for her help with this project.

Today our symposium celebrates a centenary, but our protagonist was born in 1851 and died peacefully at 91 in 1943. So what are we celebrating? We are commemorating the publication in 1899 of Lillie(n) Martin's doctoral dissertation "**Analysis of Difference Sensations**," co-authored with her sponsor, Georg Elias Müller. We have celebrated centenaries of books before. We commemorated Fechner's Elemente in 1960 in Leipzig and James' Principles in 1990. This one is special, because Martin was one of the pioneer women in psychology and should join Christine Ladd-Franklin, Mary Calkins and Margaret Floy Washburn as examples of early career women in psychology.

Lillien Martin had been a schoolteacher for several years before going back to Vassar to get her degree. Then, after some more teaching, she decided to go to Germany and work in experimental psychology. She studied in Göttingen, a first class university, known for its strength in mathematics and physics. Carl Gauss was a professor there

BEST COPY AVAILABLE

CG029637

and so was the physicist Wilhelm Weber, the brother of Ernst Heinrich Weber of Weber's law, who was a professor at Leipzig. Georg Elias Müller, her mentor, was at the time deeply involved in psychophysics, where he extended and amplified Fechner's experimental work, but not Fechner's metaphysics.

Psychophysics was concerned originally with the quantitative assessment of sense perception. Its methodology broadened later to embrace all of experimental psychology, both in theory and in application. Measurement of psychological functions became one of its most important topics. The complex, but very unexciting experiments, carried out mainly be German psychologists, caused William James to complain that the "dreadful literature" of psychophysics, the outcome of which was "just nothing," could hardly have arisen in a country whose natives could be bored.

Müller's lab was involved in precisely this kind of experiments, revising, amplifying and codifying Fechner's original methodology. (Müller also worked on color vision and on memory, but that is beyond the scope of this paper.) Müller had a positive attitude toward women as scientists, rare at that time. He worked with Mary Calkins on memory (he liked her paired associate technique) and Christine Ladd-Franklin on color vision. And somewhat later, Eleanore Gamble from Wellesley became his student. So when Lillien Martin came to Göttingen, he put her right to work on

measuring difference thresholds in weight perception, basically a muscle sense.

The technique used was the method of "right" and "wrong" cases, as Fechner called it. Today we call it the method of constant stimuli. Můller called it the method of constant differences. In making determinations one has a standard weight and a series of comparison weights, heavier or lighter than the standard. Martin and Můller used seven weights, one equal to the standard and three each above and below the weight of the standard. The subjects hefted standard and variable in succession with one hand (right, if right handed; left, if left handed) and judged them to be heavier clearly, heavier, same, lighter, lighter clearly. From the distribution of replies a curve is fitted, using a modification of the normal distribution and a difference threshold is calculated.

While the purpose of psychophysical measurement is to establish sensitivity to stimulus differences, leading to many theoretical and practical applications, Martin and Můller wanted to investigate the factors that actually affect the results when this procedure is used. Both psychological and physiological factors seem to play a role. As Můller put it in the foreword:"The contents of this volume are only a meager beginning of a psychological inquiry into the process and the factors by which our comparison of sense impressions occurs and is determined."(p.iv)

The investigation was to be Lillien Martin's doctoral dissertation, but as the foreword states:"Unfortunately Miss Martin was obliged, due to external reasons, to leave Göttingen at the end of April of last year (i.e.1889) and to return to 'Amerika.' She was the actual undertaker of this inquiry. I had to limit myself, in the main, to make sure that the findings that were based on these results would be expressed as clearly and completely as possible."(p.iv) [As we shall see, this is not entirely true.]

It is notable that the participants in the study were almost equally divided between the sexes. There were 7 male and 6 female subjects. These were Müller and Martin, Jost, Pilzecker and Schumann, Victor Henri from Binet's lab in Paris, a Dutch philosophy student de Zeltner, and Wehn (another student?). The females were Miss Smith, Miss Jewett, Miss Tiedemann, Miss Laura Steffens and Frau Professor Müller. All except Müller's wife, appear to be American. Martin and Müller were the experimenters, except that Laura Steffens conducted on session and her sister Lotte Steffens conducted two sessions for practice.

The experiments continued from January 1896 to April 1898, when Lillien Martin left. The procedure was identical with the earlier work of Müller and Schumann, which in turn was the same as that used by Fechner. The subject stood in front of a table with the weights, arms resting on a thick blanket. Movement of the arm was limited be a cord that was strung across the table. A metronome provided time signals,

usually one lift per second. The positions of standard and variable were changed systematically and the variables were, of course, presented in randomized order. The subjects were not told their performance.

Anomalous results were found in the comparisons. The time error (the sequence of which weight was lifted first or second) and the space error (which weight is on the right or the left) should have been cancelled out by appropriate permutations. They were not. In general, with equal effective difference, more "right" responses were obtained when the variable stimulus was lifted second, than when it was lifted first. This held good, whether the variable was greater or less than the standard. The influence producing this effect was a tendency to "absolute" judgment of heaviness or lightness, regardless of comparison. Interviews with subjects after the experiment confirmed that they were going on impressions of light or heavy, rather than making the comparisons with the standard.

There were two types of individuals, the positive, more muscular type, and the negative, weaker type. Classified positive were Jost, Müller, Pilzecker, Schumann, Wehn, DeZeltner and Frau Professor Müller. Negative types were the Misses Jewett,Smith, Steffens, Tiedemann, and Martin, as well as Dr. Victor Henri. Frau Professor Müller, as a German Hausfrau had plenty muscular development, Dr. Henri, on the other hand, lacked exercise and had slight muscular development. The positive type would give more "right"

judgments when the standard was heavier than the variable, the negative would give more "right" responses when the standard was less than the variable. The effect was caused by the fact that the positive type, being stronger, had an impression of lightness, the weaker negative type had the opposite impression. These judgment were therefore based, again, on absolute judgments -- not comparisons. Among others, Fullerton and Cattell in a very early American critique of Fechnerian psychophysics, wrote about it in 1892. Later, Laura Steffens discussed it (in German) in 1900.(Zeitschrift, xxiii, 260)

An effect of temporal position, in addition to the Fechnerian time error, could not be eliminated by counterbalancing. It was a positive or a negative addition to the difference between the standard and the variable, according to their time order. It was attributed to physiological causes, either fatigue or facilitation. The first lift was assumed to fatigue the motor centers, so that the second weight would seem heavier than the first. Or, if the first lift stimulated the nervous system, the second lift would be more energetic, and the second weight would seem correspondingly lighter. The negative type, particularly, showed more effects of fatigue, whereas the positive type was more likely to show the effect of facilitation. Practice, in itself, did not seem to affect the results.

Occasionally it was observed that the weight was actually compared not with its current variable, but with the weight in the preceding trial. Catch trials (Vexierversuche), where the standard stimulus became the variable stimulus, were instituted to trace this effect.

Undoubtedly Müller wanted to contribute something to dispelling the illusion that the complicated and difficult province of psychology is peculiarly one in which one can further scientific knowledge with a minimum of training and experience. He took the opportunity of this monograph to attack Wreschner's experiments with lifted weights published the previous year. (Methodologische Beiträge zur psychophysischen Messung, 1889). Wreschner had done his work under Ebbinghaus' guidance at Breslau university. His methods were slightly different from Müller's.

Müller uses 15 pages of Martin's dissertation to attack Wreschner. He calls him incompetent. His attack extends to reviewers of Wreschner's work. He scolds Scipture (Psych. Rev., 5, 1898, p. 441 ff.)and Titchener (Amer.J.Psychol., 9, 1889, p. 595) for praising Wreschner's thoroughness. To quote:"I want to allow myself to comment that those who appear as authors of voluminous summaries should have more judgment and critical acumen, so that they don't run into the danger of taking a beginner's work that is full of mistakes and viewing it as an example of scientific exactness."(p.149)

He ends by saying "that one must not necessarily take a position with respect to experimental results obtained by an investigator with unknown and unskilled subjects. On the contrary, it will contribute to the health of conditions in this field, if one would completely ignore such studies in the future."(p.155)

Titchener's reply was very mild:"The points urged against Wreschner are, no doubt, well taken, though it would have been more generous had the writers also emphasized the good features of the research."(p. 300)

Titcheners's own evaluation of Martin and Müller reads:"There can be no doubt that the work of Martin and Müller will stand as a landmark in the history of psychology,--comparable, perhaps, with such books as Hering's Lichtsinn, or Ebbinghaus' Gedächtnis; it suggests a method for the solution of many further problems."(p.309)

Boring says:"After Fechner's Elemente, this book is the classical study of lifted weights, that most thoroughly investigated psychophysical function."(p.375)

Lillien Martin's name was established with this work. She went on to do much important research, but she never returned to psychophysics.

References

Boring,E.G.(1950). A history of experimental psychology(2nd ed.) NY:Appleton-Century-Crofts.

Martin,L.J.,& Mûller,G.E.(1899) Zur Analyse der Unterschiedsempfindlichkeit. Experimentelle Beitrage.(Analysis of difference sensations. Experimental contributions). Leipzig, Germany: J.A.Barth.

Titchener,E.B.(1915).Experimental psychology (Vol.II) NY: Macmillan.